PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Imnaha River Smolt Monitoring Program Project

BPA project number: 8712703
Contract renewal date (mm/yyyy): 1/2000 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Nez Perce Tribe Department of Fisheries Resources Management

Business acronym (if appropriate) NPT

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
5.1B, 5.1B.1

FWS/NMFS Biological Opinion Number(s) which this project addresses
ESA Section 10 permit 1134, ESA Section 10 permit 822

Other planning document references
The Tribal Recovery Plan (Wy-Kan-Ush-Mi Wa-Kish-Wit 1995) states "to develop experimental and monitoring programs in association with these projects to study the relationships between natural and supplemented components of the populations". It further suggests that smolt abundance be estimated at tributary mouths to estimate egg to smolt survival production parameter. The TRP also suggets a suite of juvenile salmon passage alternatives which would require stream reach survival estimates to evaluate effectiveness of the preferred alternative through PIT tagging of smolts.

Short description
Operate smolt traps to provide the Fish Passage Center with information and indices on spring emigration timing, estimated survival, smolt performance and health of wild and hatchery salmonid smolts from the Imnaha River to Snake and Columbia River dams.

Target species
natural spring chinook salmon, hatchery spring chinook salmon, natural steelhead trout, hatchery steelhead trout

Section 2. Sorting and evaluation

Subbasin

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☐ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☐ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
8712700	Smolt Monitoring by non-Federal Entities / necessary for water budget.	The projects collect similar data and report daily catch to the Fish Passage Center. PIT tag smolts for emigration timing, travel time and estimated survival to dams. The combined data enables the Fish Passage Center to meet their goals.
8805301	Northeast Oregon Hatchery	Smolt monitoring will provide evaluation of production releases
	Lower Snake River Comp. Plan Hatchery Evaluations.	Coordination enables cost sharing and evaluation of natural and hatchery chinook salmon emigration timing, post-release survival estimation of hatchery chinook smolts, other smolt performance characteristics such as estimated survival to Snake River dams.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1998	Data collection and summary, tasks 1.1, 1.2, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 3.3, 3.4, 3.5, and 3.6	Yes. A final report will be completed Febuary 1999. All data were reported to the FPC on time

1997	All tasks completed, final draft 11/98	Yes. All data were reported to the FPC on time. Final report to be published
1996	BPA annual report, contract DE-FC79-88FC38906-13 January 1998 632, all tasks completed	Yes. All data were reported to the FPC on time and an annual report was published.
1995	BPA annual report, contract DE-FC79-88FC38906-5 January 1997 544, all tasks completed	Yes. All data were reported to the FPC on time and an annual report was published.
1994	BPA annual report, contract DE-FC79-88FC38906-4 December 1995 775, all tasks completed	Yes. All data were reported to the FPC on time and an annual report was published.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Determine the spring emigration timing of chinook salmon and steelhead trout smolts at the Imnaha River trap from March 15 to June 5.	a	Operate the outmigrant traps 5 to 7 days per week to determine the timing of anadromous samonid smolt emigration and collect fish for tagging
		b	Subsample the catch to estimate the length and weight of target species and species composition of the catch
		c	Calculate Fulton's conditon factor for target species
		d	Inspect target species for descaling and examine fins for damage as an indicator of general fish health
		e	Report outmigration information to the FPC two times per week by 1600 hours in a standard format determined by the FPC
2	Determine the emigration timing and travel time of previously PIT tagged natural and hatchery steelhead trout smolts through interrogation at the lower Imnaha River trap from March 15 to June 5.	a	Obtain release time and tag information for previously PIT tagged natural and hatchery chinook salmon and steelhead trout smolts from ODFW and the NPT
		b	Interrogate all fish collected for the presence of PIT tags
		c	Determine outmigration timing and travel time of previously PIT tagged natural and hatchery smolts at the Imnaha River trap
		d	Report all interrogation files to PTAGIS within 48 hours
3	Determine the emigration timing, travel time, recovery rate and estimated survival of natural and hatchery steelhead trout, PIT tagged at the Imnaha River trap, through the Snake and Columbia river dams.	a	PIT tag 1,400 actively outmigrating natural steelhead trout smolts over a seven week period (200 fish per week).
		b	PIT tag 3,200 actively migrating hatchery

			steelhead trout smolts over a five week period (640 fish per week). Weekly tagging is to be done over a one to three day period if possible.
		c	Edit and validate all PIT tag files using PITVAL before submission to PTAGIS.
		d	Upload PIT tagging files to PTAGIS within 48 hours.
		e	Retrieve PIT tag recovery and travel time data from PTAGIS for Snake and Columbia river dams.
		f	Calculate outmigration timing of PIT tagged natural and hatchery steelhead trout smolts from the Imnaha River to the Snake and Columbia River Dams.
		g	Determine the travel time and recovery rate of PIT tagged natural and hatchery steelhead trout smolts to Lower Granite Dam.
		h	Estimate the survival of PIT tagged natural and hatchery steelhead trout smolts to Lower Granite Dam and other dams.
4	Provide a final report summarizing the results of Imnaha River smolt monitoring studies.	a	Prepare a final report of all spring smolt monitoring activities conducted in the Imnaha River during the monitoring period.
		b	Summerize all data collected on spring chinook and report to the NPT project leader for the LSRCP Studies.
5	Manage and coordinate the PIT tag database for the Nez Perce Tribe's Enterprise Field Office	a	Manage the PIT tag database for this project and provide reports for management review.
		b	Coordinate all NPT PIT tagging projects in the Northeastern Oregon area with appropriate state, federal, and tribal agencies.
		c	Provide NPT's Research Coordinator with technical assistance in implimenting ISO tags and transceivers in Northeastern Oregon.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	2/2000	1/2020	1a, 1b, 1c, 1d, 1f		15.00%
2	2/2000	1/2020	2b, 2c, 2d, 2e		15.00%
3	2/2000	1/2020	3a, 3b, 3e, 3f, 3g, 3h		15.00%
4	6/2000	2/2020	4a	Annual Report Publication	40.00%
5	1/2000	1/2020			15.00%
				Total	100.00%

Schedule constraints

High river water discharge and debris loads may preclude trap operations and data collection for the Fish Passage Center. These conditions may damage the trap, cause debris to injure fish in the trap, or create unsafe conditions for the crew.

Completion date
2020 - The project is viewed as a long-term monitoring tool for natural and hatchery anadromous salmonid smolts in the Imnaha River subbasin.

Section 5. Budget

FY99 project budget (BPA obligated): $185,600

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	3 FTE, 2PTE, and Admin. Support	%48	91,088
Fringe benefits	27% FTE, 12% PTE	%9	17,244
Supplies, materials, non-expendable property	Office Services, supplies and utilities, telephone, internet, & rent	%6	11,136
Operations & maintenance	vehicle lease and maintainace, trap repair	%7	13,080
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	computer and software upgrades, field communication equipment	%2	3,140
NEPA costs		%0	0
Construction-related support		%0	0
PIT tags	# of tags: 4600	%7	13,340
Travel		%3	4,960
Indirect costs		%15	28,734
Subcontractor		%0	0
Other	New PIT tagging equipment	%3	6,000
TOTAL BPA FY2000 BUDGET REQUEST			$188,722

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
USFWS/LSRCP		%16	61,620
	Vehicles and mileage	%2	6,000
	Office Services - supplies, office rent, telephone, fax.	%2	6,420
	Field Supplies - incl. trap maintenance	%1	4,600
	Perdiem	%1	3,000
	PIT Tags (14,600 tags @2.90/tag)	%11	42,340
	Screw Traps - two 7' traps	%8	30,000
	Computers - two desk top and two laptops	%3	10,400
	Trailer -one purchased, two surplus trailers	%3	12,000
	PIT Tag Station	%2	8,000

	Indirect Rate (excl. equipment)	%5	18,700
		Total project cost (including BPA portion)	$391,802

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$174,000	$177,000	$180,000	$183,000

Section 6. References

Watershed?	Reference
☐	Ashe, B. L., A. C. Miller, P. A. Kucera, and M. L. Blenden. 1995. Spring outmigration of wild and hatchery chinook salmon and steelhead trout smolts from the Imnaha River, March 1 - June 15, 1994. FPC Technical Report. NPT DFRM Lapwai, Idaho
☐	Bagenal, T. B., and F. W. Tesch. 1978. Age and growth. Pages 101-136 in T.B.Bagenal, editor. Methods for assessment of fish production in fresh waters, 3rd edition. Blackwell Scientific Publications, Oxford, England.
☐	Bell, Milo C. 1981. Updated Compendium on success of passage of small fish through turbines. US Army Corps. of Engineers, North Pacific Division
☐	Blenden, M. L., R. S. Osborne, and P. A. Kucera. 1996. Spring outmigration of wild and hatchery chinook salmon and steelhead trout smolts from the Imnaha River, Oregon, February 6 - June 20, 1995. Fish Passage Center Technical Report. NPT DFRM. Lapwai, ID
☐	Efron, B., and R. Tibshirani. 1986. Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. Statistical Science 1:54-77.
☐	Giorgi, A.E. and L. Stuehrenberg.. 1988. Lower granite pool and turbine survival study, 1987. Portland, Bonneville Power Administration. Oregon:30.
☐	Independent Scientific Group. 1996. Return to the River. Restoration of salmonid fishes in the Columbia River ecosystem. Prepublication copy. Sept. 10, 1996. 584 pp.
☐	Iwamoto, R.N., W.D. Muir,B.P. Sandford, K.W. McIntyre, D.A. Frost, J.G. Williams, S.G. Smith and J.R. Skalski. 1994. Survival estimates for the passage of juvenile salmonids through Snake River dams and reservoirs. BPA. Portland, Oregon.
☐	James, G. 1984. Imnaha River basin recommended salmon and steelhead habitat improvement measures. Working paper. Confederated Tribes of the Umatilla Indian Reservation.
☐	Kennen, J. G., S. J. Wisniewski, N. H. Ringler, and H. M. Hawkins. 1994. Application and modification of an auger trap to quantify emigrating fishes in Lake Ontario tributaries. North American Journal of Fisheries Management 14:828-836.
☐	Kucera, P. A. 1989. Nez Perce Tribal review of the Imnaha River Lower Snake River Compensation Plan. Working paper. LSRCP Technical Report AFF1/LSR-89-08. Nez Perce tribe Fisheries Management, Lapwai, Idaho
☐	Long, C.W. 1968. Diel movement and vertical distribution of juvenile anadromous fish in

	turbine intakes. U.S. Fishery Bulletin 66:599-609.
☐	Long, C.W., F.J. Ossiander, T.E. Ruehle and G.M. Mathews. 1975. Survival of coho salmon fingerlings passing through operating turbines with and …without a flow detector. NMFS/NOAA Northwest Fisheries Science Center: 8
☐	Matthews, G. M., J. R. Harmon, S. Achord, O. W. Johnson, and L. A. Kubin. 1990.Evaluation of transportation…on the Columbia and Snake Rivers, 1989. Report to the U.S. Army Corps of Engineers, Contract DACW68-84-H0034. NMFS. Seattle, Washington.
☐	Matthews, G. M., S. Accord, J. R. Harmon, O. W. Johnson, D. M. Marsh, B. P. Sandford, N. N. Paasch, K. W. McIntyre, and K. L. Thomas. 1992. Evaluation of transportation of juvenile salmonids…Columbia and Snake Rivers, 1990.Report to USACE, Seattle
☐	Muir, W.D., S.G. Smith, R.N. Iwamoto, D.J. Kamikawa, K.W. McIntyre, E.E. Hockersmith, B.P. Sanford, P.A. Ocker, T.E. Ruehle and J.G. Williams. 1995. Survival estimates for the passage of juvenile salmonids through Snake River dams and reservoirs. BPA, OR.
☐	Murphy, M. L., J. F. Thedinga, and J. J. Pella. In Prep. A bootstrap method for obtaining confidence intervals for population estimates of migrating fish. National Marine Fisheries Service. Juneau, Alaska.
☐	Northwest Power Planning Council. 1987. 1987 Columbia River Basin Fish and Wildlife Program. Portland, Northwest Power Planning Council. Oregon:246.
☐	Ott, L. 1984. An introduction to statistical methods and data analysis. PWS Publishers. Boston, Massachusetts
☐	Prentice, E. F., D. L. Park, T. A. Flagg, and S. McCutcheon. 1986. A study to determine the biological feasibility of a new fish tagging system, 1985-1986. Report to the Bonneville Power Administration, Contract DE-A179-83BP11982, Project 83-119. NMFS
☐	Prentice, E. F., T. A. Flagg, C. S. McCutcheon, D. F. Brastow, and D. C. Cross. 1990b. Equipment, methods, and an automated data-entry station for PIT tagging. American Fisheries Society Symposium 7:335-340.
☐	Skalski, J.R. et al.1994. Statistical Survival Analysis of Fish and Wildlife Tagging Studies (SURPH.1). BPA project # 89-107. Bonneville Power Administration. Portland, Oregon.
☐	Statgraphics Plus. 1995. Statgraphics Plus Version 2. Manugistics, Inc. Rockville, Maryland.
☒	Thedinga, J. F., M. L. Murphy, S. W. Johnson, J. M. Lorenz, and K. V. Koski. 1994. Determination of salmonid smolt yield with rotary screw traps in the Situk River, Alaska, to predict effects of glacial flooding. North American J.F.M. 14:837-851
☐	Weitkamp, D.W, D. McKenzie and T. Schadt. 1980. Survival of steelhead smolts - Wells Dam turbines and spillway, 1980. East Wenatchee, Public Utility District No. 1 of Douglass County. Washington:39.

PART II - NARRATIVE

Section 7. Abstract

This program provides management with timely information to base in-season water budgets, evaluate spill requests, and monitor general fish health. We seek to document

migration trends of chinook and steelhead smolts emigrating out of the Imnaha River and to estimate survival of steelhead smolts through the Snake and Columbia River dams. To accomplish these goals we will determine the spring emigration timing of chinook and steelhead smolts in the Imnaha River. Additionally, we will determine the emigration timing and travel time of previously PIT tagged natural and hatchery steelhead smolts. Estimating survival will be accomplished through use of the SURPH model and by determining the recovery rates of natural and hatchery steelhead trout, PIT tagged at the Imnaha River trap, through the Snake and Columbia River dams.

The Northwest Power Planning Council mandates the smolt monitoring program in section 5.1B of the Columbia River Basin Fish and Wildlife Program. Data from the Imnaha River assists in this mandate.

Our approach will be to operate a pair of outmigrant traps as an interrogation site from March 15 to June 5. Anadromous salmonid smolts and other incidental catch will be subsampled for biological data. Natural and hatchery steelhead will be PIT tagged to estimate emigration timing, travel time and survival through the mainstem river hydro-system corridor.

Expected outcome is providing information on the emigration timing of Imnaha River smolts, dam arrival timing, daily fish health, performance, and survival from the Imnaha River through the Snake River and Columbia River dams. Results of each year's investigations are provided in an annual report format for review and dissemination.

Section 8. Project description

a. Technical and/or scientific background

The Northwest Power Planning Council's (NPPC) program includes measures for flow, spill, and drawdown to provide for partial mitigation for losses due to operation of the mainstem dams on the Snake and Columbia River. The program establishes and directs the Fish Passage Center (FPC) to manage fish mitigation measures on behalf of the fishery agencies and tribes represented on the Columbia Basin Fish and Wildlife Authority (CBFWA). The FPC plans the annual Smolt Monitoring Program (SMP) which is implemented at smolt monitoring sites. The Nez Perce Tribe proposes to continue implementation of the smolt monitoring and PIT tagging program on the Imnaha River in 2000. Northwest Power Planning Council program measure 5.1B directs activities that are to be conducted under the FPC. Measure 5.1B.1 directs Bonneville Power Administration to fund and support the Fish Passage Manager in 1) planning and implementing the annual smolt monitoring program, 2) developing and implementing flow and spill requests, and 3) monitoring and analyzing research results to assist in implementing the water budget and spill planning and in preparing reports. The Imnaha Smolt Monitoring Program (ISMP) provides information vital to carrying out the FPC directive under the NPPC program.

Various authors have identified that mortality of anadromous salmonid smolts occurring in the mainstem Snake River and Columbia River hydrolectric projects may be a limiting factor for salmon recovery and mitigation efforts. Bell et al. (1981), as reported in Independent Scientific Group (1996), reported a range of 6-20% turbine mortality of juvenile chinook in the Columbia River. Other authors have reported similar ranges in mortality associated with passage through turbines (Iwamoto et al. 1994, Long et al. 1975, Long 1968, Muir et al. 1995a, Giorgi and Stuehrenberg 1988, and Weitkamp et al. 1981). The NPPC (1987) reported that a 15% per dam turbine mortality was a generally accepted figure. Other authors have reported that only 46.3-51.9% of Imnaha River hatchery chinook survive from the Imnaha River to Lower Monumental Dam in the Snake River from 1993 to 1997 (Iwamoto et al. 1994, Muir et al. 1995, and Smith et al. 1998).

Operation of the Imnaha River smolt traps provides the FPC with information on spring emigration timing of natural and hatchery chinook salmon and steelhead trout smolts from the Imnaha River. Additionally, the traps allow us to assess fish health on a daily basis and provide specimens for PIT tagging. Indices of migration strength and migration timing are provided for Imnaha River smolts and smolts from the run at large at key monitoring sites. PIT tagged smolts provide measures of travel time and in-river survival through key index reaches. Fish quality and descaling information are collected at the Imnaha River trap site and provide indicators of the health of emigrating smolts.

The ISMP will monitor outmigration timing and PIT tag actively migrating natural and hatchery steelhead trout smolts in the Imnaha River to provide the FPC with information needed to conduct the annual SMP. Smolt monitoring and PIT tagging will be conducted during the spring outmigration period (March 15 - June 5) to provide in-season information on smolt movement out of the Imnaha River for water budget and other management decisions. We will PIT tag up to 4,600 total steelhead (hatchery and natural) to estimate the outmigration timing, travel time and recovery rate (as an index of survival) from the mouth of the Imnaha River to Snake River and other Columbia River .

State, federal and tribal representatives consided ISMP a high priority during the CBFWA review process. This project has been ongoing since 1994 as part of the Smolt Monitoring by Non-Federal Entities (Project No. 8712700) and is coordinated with all salmon managers in the Columbia River basin.

In 1992, the Nez Perce Tribe began the Imnaha River outmigration studies project as a long term monitoring tool funded by the U.S. Fish and Wildlife Service under the Lower Snake River Compensation Plan (LSRCP) hatchery program. The project was intended to evaluate smolt performance characteristics of hatchery released chinook salmon smolts (490,000) and 330,000 hatchery reared steelhead smolts. The project was also intended to collect information on smolt performance characteristics and survival of naturally produced juvenile chinook salmon (fall and spring emigrants) and steelhead smolts. **Since the inception of the ISMP in 1994, the LSRCP hatchery evaluations project has cost-shared this study and focused on natural and hatchery chinook salmon. The ISMP has focused their efforts on the steelhead smolt performance and survival**. Project planning, trapping personnel requirements, equipment, field supplies, trap maintenance, PIT tagging requirements, data analysis and report writing are tightly coordinated to eliminate duplication of effort and to efficiently utilize available funds. Annual reports produced since 1994 have been co-authored by LSRCP and ISMP staff and have incorporated LSRCP study results in them to make the information available in one place, and have served to meet project deliverables for both studies.

The ISMP is closely coordinated with ongoing Lower Snake River Compensation Plan (LSRCP) hatchery evaluation studies in the Imnaha River with the Oregon Department of Fish and Wildlife through annual operation plan meetings. The Tribal LSRCP hatchery evaluations program provides cost-share funds which are tightly coordinated to ensure collection of an essential and non-duplicative time series of information on fall and spring anadromous salmonid emigration from the Imnaha River. This project is consistent with the direction given by the Northwest Power Planning Council program measure 5.1B.

b. Rationale and significance to Regional Programs

The rationale behind the ISMP is to provide managers with in-season information on chinook salmon and steelhead smolt emigration relative to water budget and spill planning in the mainstem Snake and Columbia River hydroelectric corridor. In-season shaping of the water budget, dam operations and spill requests are crucial to maximize smolt survival past the eight hydroelectric projects. The Imnaha River provides a tributary specific in-season view of the magnitude of the run from the Imnaha for natural and hatchery chinook salmon and steelhead trout. The use of the smolt traps and PIT tags enable us to estimate the emigration timing from the Imnaha River, emigration timing at the dams, travel time to dams, general health of the migration, and estimated survival from the Imnaha River to Snake River dams and to McNary Dam. Salmon managers can use this information to pattern each respective year's water budget and spill requests to fit the needs of emigrating smolts during the current migration year. **Survival can be improved with specific outmigration information. For example, when this study was initiated in**

1994, 90% of the natural Imnaha River chinook salmon smolts migrated past Lower Granite Dam (LGR) before spill was initiated in an attempt to improve survival. ISMP identified the outmigration timing and the ranges in timing from the Imnaha River, and the median and 90% arrival timing dates at LGR. This demonstrates how the water budget can be shaped to provide improved survival conditions for Imnaha River chinook salmon smolts.

The NPPC (1994) devotes an entire section (Section 5) of the Columbia River Basin Fish and Wildlife Program to addressing juvenile salmon migration. It embraces an adaptive management approach and outlines nine sub-sections and an adaptive management strategy. Sub-section 5.1, titled Coordinated River Operations, addresses the need and rationale for the Imnaha River Smolt Monitoring Program.

ISMP is coordinated with relevant projects with the NPT and FPC. All FPC Smolt Monitoring sites report data in electronic format on a daily basis to a central FPC database. The Grande Ronde River Smolt Monitoring Project, conducted by ODFW, provides tributary specific information on emigrating chinook salmon and steelhead trout smolts (Project 8712700). IDFG operates two traps, one at Whitebird on the Salmon River and the other on the Snake River. Both provide similar information on groups of salmon and steelhead smolts from various tributaries. Sampling at the dams also occurs as part of project 8712700 to assess smolt quality, descaling, species composition (hatchery and natural status) and gas bubble trauma sampling. The Idaho Supplementation Studies conducts outmigrant trapping on treatment and control streams as part of their experimental design (Project No. 8909802, 8909800, 8909801 and 8909803). The Nez Perce Tribal Hatchery conducts outmigrant trapping on several tributary streams under project 8335000.

We believe the ISMP has the potential to provide unique opportunities for research because of ongoing LSRCP supplementation programs for listed chinook and steelhead trout. We believe that an opportunity exists to transform the existing outmigrant trapping facility to a more permanent facility. This would allow a comprehensive monitoring approach to determining smolt yield, natural production, in-river survival and survival estimations to dams. This would allow us the ability to meet one of the Tribal Recovery Plan (1995) recommendations of estimating smolt abundance and estimating the egg to smolt survival parameter. It would allow a more complete analysis of the supplementation program and provide the region with the knowledge of the success of Snake River basin program. We believe this type of comprehensive monitoring would be useful in several select subbasins in the Snake River basin**.**

c. Relationships to other projects

This project was previously a component of the Smolt Monitoring by Non-Federal Entities project (Project No. 8712703) and complements other tributary specific smolt monitoring projects conducted by state and federal agencies by collecting and reporting Imnaha River anadromous salmonid smolt information for in-season shaping of the water budget and for spill recommendations. It is an important component of the Snake and Columbia basin's smolt monitoring effort. In the past gill ATPase samples have been collected by the USFWS at the Imnaha River trap and steelhead smolts have been subsampled and utilized for radio telemetry studies. This study has coordinated with the University of Washington in application of using the Survival Using Proportional Hazards (SURPH.1) model for survival estimation (Smith et al. 1994).

This project is tightly coordinated with and cost-shares with monitoring and evaluation work being conducted for Tribal LSRCP hatchery evaluations program which began in 1992. This coordination ensures that no duplication of effort exists and that funding resources are utilized to the maximum benefit possible. The cost sharing allows a natural chinook smolt survival estimation project under LSRCP to occur that is designed to PIT tag up to 10,000 spring emigrating smolts and 4,000 fall emigrating chinook annually.

Section 10 permits are maintained for the conduct of the study. The current permit, number 1134, was obtained through coordination with the Columbia River Inner Tribal Fisheries Commission. Additionally, the FPC maintains permit number 822.

d. Project history (for ongoing projects)

This project was initially funded under project 872700 and is now funded as 872703.
Project Reports include:

Ashe, B. L., A. C. Miller, P. A. Kucera, and M. L. Blenden. 1995. Spring outmigration of wild and hatchery chinook salmon and steelhead trout smolts from the Imnaha River, March 1 - June 15, 1994. Annual project report to the Bonneville Power Administration. Nez Perce Tribe Fisheries Management, Lapwai, Idaho. 76 pp.

Blenden, M. L., R. S. Osborne, and P. A. Kucera. 1996. Spring outmigration of wild and hatchery chinook salmon and steelhead trout smolts from the Imnaha River, Oregon, February 6 - June 20, 1995.Annual project report to the Bonneville Power Administration. Nez Perce Tribe Department of Fisheries Resources Management, Lapwai, Idaho. 74 pp.

Blenden, M. L., S. Rocklage and P. A. Kucera. 1997. Spring outmigration of wild and hatchery chinook salmon and steelhead trout smolts from the Imnaha River, Oregon, February 23 - June 24, 1996.Annual project report to the Bonneville Power Administration. Nez Perce Tribe Department of Fisheries Resources Management, Lapwai, Idaho. pp.

Blenden, M. L., P. A. Kucera and E. Veach. (In press). Spring outmigration of wild and hatchery chinook salmon and steelhead trout smolts from the Imnaha River, Oregon, February 25 - June 27, 1997. Annual project report to the Bonneville Power Administration. Nez Perce Tribe Department of Fisheries Resources Management, Lapwai, Idaho.

Summary of Major Results: Above mentioned reports contain major project results from 1994 to 1997. Some major accomplishments include:
1. Identification of emigration timing of listed natural and hatchery steelhead trout and chinook salmon smolts from the Imnaha River.
2. Describing biological characteristics and general health of anadromous salmonid smolts from the Imnaha River.
3. Estimation of smolt yield for natural and hatchery chinook and steelhead trout smolts during select years.
4. Providing tributary specific data through PIT tagging of natural and hatchery Imnaha River steelhead trout smolts.
5. Documenting arrrival timing at Snake River dams and McNary Dam with ranges in timing, median and 90% arrival dates from 1994 to 1997.
6. Examining diel passage information of Imnaha River smolts at several Snake River dams.
7. Determining travel times of the various groups to Lower Granite Dam.
8. Determining cumulative recovery rates at Lower Granite Dam as a minimum survival estimate.
9. Estimating survival of PIT tagged Imnaha River smolts to Snake River dams through use of the SURPH model.

Adaptive Management Implications: The Imnaha River smolt monitoring program provides current information on the spring emigration timing of wild and hatchery chinook salmon and steelhead trout smolts from the Imnaha River and provides data on PIT tagged fish arrival timing at dams, travel time to the dams and relative survival to the dams. In that regard it provides managers in-season information on which to base water budget and water spill decisions relative to management of threatened steelhead smolts.

Years Underway: This project has been providing a time series of anadromous salmonid emigration information from the Imnaha River since 1994.

Past Costs: 1994 - $72,985; 1995 - $103,516; 1996 - $142,213; 1997 - $143,726; 1998 –$175,252

e. Proposal objectives

Objective 1: Determine the spring emigration timing of chinook salmon and steelhead trout smolts at the Imnaha River traps from March 15 to June 5. This information will allow management to evaluate the current year's water budget and spill requests. It is important to determine when the emigration timing is occuring in relation to water discharge.

Objective 2: Determine the emigration timing and travel time of previously PIT tagged natural and hatchery chinook salmon smolts at the Imnaha trap through interrogation at the lower Imnaha River traps from March 15 to June 5. Using the Imnaha River traps as an interrogation site enables us to caculate the travel time from the point of release to the traps and to Lower Granite Dam for hatchery reared fish. The information also allows us to calculate survival and compare the results to natural fish and hatchery fish tagged at the traps. The results will contribute to our knowledge of how flow and water temperature affect outmigration.

Objective 3: Determine the emigration timing, travel time, recovery rate, and relative survival of PIT tagged natural and hatchery steelhead trout smolts from the Imnaha River through the Snake River and Columbia River dams. This information will enable us to evaluate if the current year's water budget and spill requests were benifical to the survival and health of the Imnaha fish as they migrate downstream. Furthermore, the survival estimates through Lower Monumental Dam quantifies the loss of fish to the Snake and Columbia River dams. Past survival estimates for natural steelhead smolts fom the Imnaha River to Lower Granite Dam have ranged from 73.1 to 93.1% (1994 to 1997). Estimated survival of hatchery steelhead smolts to LGR ranged from 51.4-91.4% from 1994 to 1997.

The products resulting from this project are annual reports summarizing all information collected relative to study goals and objectives.

f. Methods

A. Study Area: The Imnaha River subbasin is located in northeastern Oregon and encompasses an area of approximately 2,538 square kilometers. The mainstem Imnaha River flows in a northerly direction for 129 km from its headwaters in the Eagle Cap Wilderness Area (ECWA) to its confluence with the Snake River at river kilometer (rkm) 308.4 (James 1984; Kucera 1989). Elevations in the watershed vary from 3,048 m at the headwaters to about 260 m in lower elevations (Kucera 1989). River discharge during the spring emigration period has ranged from 160 to 4,030 cfs from 1994-1997.

B. Equipment Description: Two floating rotary screw traps manufactured by E.G. Solutions Inc., Corvallis, Oregon, will be used to capture outmigrating salmonid smolts for this study. Similar traps have been used to capture migrating salmonid species in New York and Alaska (Kennen et al. 1994; Thedinga et al. 1994) and throughout the Pacific Northwest. The trap consisted of a non-standard 2.1 m diameter trapping cone supported by a metal A-frame and two six meter pontoons that provided flotation. Fish entering the

trapping cone move through to a custom oversize live box (1.68 m wide x 1.25 m long x 0.55 m deep). The live box is custom-fitted with a removable baffle to dissipate water velocity during high flows. Water temperature information for this study will be collected using a Ryan constant recording TempMentor. Discharge information will be obtained from the U.S. Geological Survey, USGS gauge 13292000 at Imnaha, Oregon (rkm 32).

C. Trap Operations and Fish Handling Procedures: The Imnaha River traps will be installed and operated in mid-February. The traps will be installed early to fulfill LSRCP and ISMP objectives to determine emigration timing of natural and hatchery steelhead trout and chinook salmon smolts. The two traps will be operated 24 hours a day, five days a week during this period. Exceptions to this will be when hatchery releases occur, trap repair is necessary, high flows occur, or debris load in the river prevent safe trap operation. Only one trap is fished during hatchery releases.

The traps will be located 6.6 kilometers from the confluence with the Snake River. The traps positions in the river will be manipulated using a cable suspension system which allows side to side and upstream/downstream movement of the trap. The trap is fished in one of three positions depending on daily readings from the staff gauge located approximately one kilometer upstream of the trap. The maximum variation in the position is 3 meters.

The live box of the screw-trap is checked every morning and several times throughout the night and day. Non-target piscivorous fish and large numbers of other non-target fish will be removed from the live box first. Non-target piscivorous fish will be scanned for PIT tags as well as all salmonids and then released 30-50 meters downstream . Natural juvenile chinook salmon will be processed first, followed by hatchery chinook salmon, natural steelhead trout and hatchery steelhead trout smolts, respectively.

Daily processing procedures will be similar to those reported by Ashe et al. (1995). Fish will be anaesthetized in a MS-222 bath (3 mL MS-222 stock solution (100g/L) per 19 L of water) buffered with propolyaqua (PRO-NOVAQUA). Each fish is examined for existing marks (e.g. fin clips), and PIT tag insertion scars. Fish with PIT tag scars will be scanned with an ISO PIT tag scanner. A specified number of natural and hatchery steelhead will be selected for PIT tagging. Twenty percent of all fish will be sampled for fork-length, weight, and descaling (minimum of 100 fish per week). Fish will be enumerated by species and released 30-50m downstream from the trap. All fish mortality is recorded.

Exceptions to this procedure may occur after hatchery releases when potential exists for capture of large numbers of fish in one night. On these occasions multiple netfulls of fish will be removed from the live box and released through a remote PIT tag scanner into the river. In previous years we have used a Biomark model RM-DC400-6. In the year 2000 we will modify a Destron-Fearing ISO transciever and racket antennae. Sub-sampling occurs when tallying fish by hand can not keep up with the rate of fish accumulation into the live box of the trap. The daily catch estimate and catch composition is calculated by sampling every tenth net of fish.

D. PIT Tagging: Fish selected for passive integrated transponder (PIT) tagging will be examined for previous PIT tagging, descaling and general health before being tagged, measured (FL-mm) and weighed (0.1 g). A representative sample of steelhead smolts will be PIT tagged. Fish will be PIT tagged using hand injector units following the general methods described by Prentice et al. (1986, 1990b) and Matthews et al. (1990, 1992). Hypodermic injector units will be sterilized after each use in ethanol alcohol for at least 10 minutes prior to tagging. PIT tags will be also sterilized for 10 minutes and allowed to air-dry prior to their use. Tagging is discontinued when water temperatures exceeded 15 C.

Weekly steelhead smolt tagging goals are established after coordination with the FPC. These goals will be modified as the season progresses based upon catch and interruptions in trapping due to equipment repairs. An additional 960 additional natural chinook, 1000 hatchery chinook salmon, 500 natural steelhead, and 400 hatchery steelhead smolts will be tagged each week as part of a separate NPT investigation. Steelhead trout smolts tagged for FPC and NPT investigations will be held for a minimum of one hour after tagging until fully recovered and then released as a group.

E. Objective 1: The screw traps mentioned in the previous section B will be used to accomplish the tasks in objective one. Critical assumptions are that the screw traps will catch a representative sample of migrating natural and hatchery fish.

The daily catch will be sampled as previously mentioned (section C). This will accomplish tasks 1a, 1b, and 1d. Fulton's condition factors for task 1c will be calculated as: $(W/L^{3}) \times 10^{5}$ (Bagenal and Tesch 1978). The daily catch and percent descaling of target species will be reported the FPC on Tuesdays and Thursdays to accommodate management needs and fulfill task 1e. Special care is given to the catch in the form of the custom live boxes mentioned in the previous section B. However, sudden increases in water discharges are common in the Imnaha drainage. Large debris loads, resulting from increases in water discharge, may cause the traps to sink and would pose a risk to target species and trap personnel. High water discharge may even damage the site by pulling the dead-man that anchor the trap loose. Due to these reasons the traps will be pulled during high flow periods.

Subsampling the fish catch to collect biological information from 100 individuals per week (10% of the sample) for length and weight measurements is the generally considered the minimum needed to get a representative sample. Twenty percent will ensure that there will be enough lengths and weights taken in unison to calculate condition factors that will be represenative of the migrating target species. Length and weight frequency distributions will be presented in bar charts. Significant differences in lengths, weights, and condition factors of natural and hatchery, and PIT tagged and non-PIT tagged natural and hatchery fish will be compared using a Students-T test. Natural steelhead with length less that 120mm are believed not to be smolts and will not be included in length, weight, and condition factor calculations. Catch composition and descaling for target species will be calculated as a percentage of the total catch. Emigration timing at the traps will be presented as an arrival frequency distribution for each target species. These results will be compared to previous years results.

F. Objective 2: Task 2b is an essential step towards accomplishing task 2c and objective 2. It will require multiple shifts of personnel and a remote monitor during hatchery releases (see section C). It is necessary to interrogate 100% of the catch. At best, the traps are 30% efficient. Failing to interrogate part of the catch may skew the results. We will prepare for hatchery releases by obtaining release information from ODFW (task 2a). The method for interrogating fish for PIT tags is described in section IC. Interrogations of previously PIT tagged fish will be reported to PTAGIS within 48 hours (task 2f). Data for estimating travel time to the Imnaha traps and relative survival for tasks 2c and 2d will be retrieved from the PTAGIS database at the end of the field season.

There are three assumptions that will be made in addition to those mentioned in objective 1. 1)PIT tagging does not affect smolt behavior or survival. 2)PIT tagged smolts are representative of the population as a whole. 3)Fish captured and used for trap efficiencies will be represenativie of the population as a whole.

The trap efficiencies will be conducted on a daily basis during the outmigration of hatchery chinook. This usually last ten days. We will only use hatchery chinook. Fish will be marked with fin clips in groups of at least 250 fish. The sample size was determined by reviewing results from previous years. Trap efficiencies will be calculated as $E = R/M$; where E is the estimated trap efficiency, R is the number of fish recaptured, and M is the number of fish marked and released. Out migration numbers will be estimated as $N = U/E$; where N = the total number of emigrants, and U is the total number of unmarked fish. The hatchery chinook salmon smolt outmigration period is divided into flow periods based on discharge. Smolt yield is determined for each flow period using the bootstrap method (Efron and Tibshirani 1986; Murphy et al. in prep).

PIT tag interrogation data will be retrieved from PTAGIS database and processed for the SURPH program with the program CAPTHIST. Both programs were developed by the University of Washington's Center of Quantitative Science School of Fisheries. CAPTHIST is designed to arrange CSV lists obtained from PTAGIS into SURPH data files. SURPH is a statistical model designed to analyize release-recapture data for survival estimates (Skalski et al. 1994).

G. Objective 3: Objective 3 will be accomplished by PIT tagging part of the catch as mentioned in section D. Tasks 3a through 3e are working tasks that will be accomplished in the field and office at the end of the field season.

The critical assumptions are as follows: the rotary screw trap collects a representative sample of natural and hatchery chinook salmon and steelhead trout smolts emigrating from the Imnaha River, trapping and handling does not adversely affect smolt behavior or survival, PIT tagging does not affect smolt behavior or survival, and PIT tagged smolts are representative of the population as a whole.

Data analysis will be done in two parts. Outmigration timing, travel times, and recovery rate to Lower Granite Dam and other dams in the hydo-system will use first observation detections from the PTAGIS database. Single coil hits and negative travel times for individual fish will be deleted from the analysis. Additionally, estimates will not include subsequent detections of fish that were captured in the Snake River

trap, held in sample rooms or raceways. Survival to Lower Granite Dam will be estimated using the SURPH model as outlined in the methods for objective 2.

Differences in mean travel time, from weekly PIT tag release groups, will be analyzed by means of a t-test (Statgraphics Plus 1995). It will be assumed, with independent samples and a combined sample size n1+n2 > 30, that t-methods will be reasonably accurate even with modest skewness in the two populations (Ott 1984). T-test values will be calculated and reported from samples with unequal variance. Differences in means will be tested and considered significant at the 0.05 level. When the assumption of normality will be violated, the t-test will be abandoned in favor of the Wilcoxon rank sum test statistic (Ott 1984). This test will compare median travel times of hatchery and natural smolts.

g. Facilities and equipment

The NPT's Enterprise Field Office in Oregon is currently being utilized for this project. This office provides adequate administrative space and a fenced compound storage and parking. The project uses two seven foot rotary screw traps with an additional seven foot trap available as backup. Two PIT tag stations are available and are used in tandem or with one serving as backup. There are three laptop computers to facilitate tagging and data summary while in the field. Three 4x4 vehicles serve as transportation.

Three trailers, parked at the U.S. Forest Service Thorn Creek Guard Station on the lower Imnaha River, serve as housing for personnel and equipment storage during the spring trapping season. The trailer site is located within five minutes of the trap site and is stationed by project personnel whenever trapping occurs. The facility will be upgraded in 1999 with an improved septic system. Staff also utilize a wall tent on-site for the collection of biological information from fish, and for PIT tagging and recovery of fish prior to release.

h. Budget

Personnel cost include 12-month salaries for a full time project leader and production assistant. Additionally, 3-month salary will be paid to fund an office manager's position for the Enterprise Field Office. The remainder of the salary line item will fund two temporary seasonal aide positions for emigrant trapping, one month of the program leader, two weeks of research coordinator, and two administrative positions one month each. Personnel costs do not include salaries of LSRCP assisting with trapping in the spring. This is a shared-cost between NPT programs. Fringe benefits associated with salaries will be charged at a rate of 27% for full time employees and 12% for temporary employees.

The supply line item includes office rent and services. These expenses are shared between four NPT projects stationed out of Enterprise. Budgeted operation and maintenance expenditures are based on past expenses on trap repair and site maintenance. We anticipate not NEPA or Construction Related Costs. Funds for capital aquistions will provide for replacement equipment and new field communication equipment. PIT tag costs are based on goals for 1998. Costs of tags supplied by LSRCP are not included. Travel expenses allow for two trips to Portland for the project leader to allow him to coordinate with the FPC. Two trips for administrative personnel are included as well.

The other line item cost allows for the purchase of new ISO PIT tag scanners and replacement equipment for tagging. The current equipment has been in service as early as 1992.

Section 9. Key personnel

Program Director:	Paul Kucera**, 0.**1 FTE**,** Provides technical direction and coordination with administration of program.

Research Coordinator:	Jay Hesse, 0.05 FTE, Coordinates LSRCP studies with Imnaha Smolt Monitoring and provides technical direction.
Project Leader:	Peter Cleary, 1 FTE, Conducts the Imnaha Smolt Monitoring Program, Coordinates with FPC, and prepares the annual report
Fisheries Biologist:	Glen Szerlong, 0.5 FTE, assists with the Imnaha Smolt Monitoring Program in the spring (LSRCP funded).
Asst. Project Leader	Michael Blenden, 0.3 FTE, assists with project planning, spring trapping, data analysis and report writing (LSRCP funded).
Production Assistant:	Glenda Claire, 0.5 FTE, assists with the Imnaha Smolt Monitoring Program in the spring (LSRCP funded).
Production Assistant:	Joe McCormack, 1 FTE, assists with the Imnaha Smolt Monitoring Program in the spring

Peter Cleary, Project Leader

Work Address: Nez Perce Tribe Dept. of Fisheries Resource Management
612 2nd Street
Enterprise, Oregon 97828
(541) 426-5986

Experience

1998 to present	Project Leader with the Nez Perce Tribe Department of Fisheries Resources Management. Responsible for the Imnaha Smolt Monitoring Program.
1997 to 1998	Fisheries Biologist with the Nez Perce Tribe Department of Fisheries Resources Management. Responsible for conducting research for the Idaho Salmon Supplementation Studies.
1997 to 1994	Lead Fisheries Technician with the Nez Perce Tribe Department of Fisheries Resource Management. Conducted research and coordinated field activities for the Idaho Salmon Supplementation Studies.
1994	Experimental Biological Aide for Oregon Department of Fish and Wildlife. Responsible for conducting a steelhead creel survey along the Wallowa River.
1994 to 1993	Biological Aide for Idaho Department of Fish and Game, McCall Hatchery. Tended to chinook salmon, egg to smolt, and spawned adults.
1993	Volunteer Work for Frank Frost, Graduate Student, University of Idaho. Assisted with a juvenile trap and adult weir for kokanee.

Education

1992	Bachelor of Science Oregon State University Major: Zoology

Publications

Hesse, J.A., P.J. Cleary, and B.D. Arnsberg. 1995. Salmon Supplementation Studies in Idaho Rivers. Annual Report - 1993. U.S. Department of Energy - Bonneville Power Administration. Portland, Oregon.

Paul Kucera, Director of Biological Services, is the program leader for the Imnaha River Smolt Monitoring Program project. Mr. Kucera has 23 years professional experience as a Fisheries Biologist in research, management and administration and is a Certified Fisheries Scientist with AFS. He has authored or co-authored seven peer-reviewed fisheries journal publicaions and over 40 project reports. Responsible for technical program direction and administration of the Fisheries Research Division. This position fills 0.1 FTE.

Education:	Bachelor of Science, 1975 Major: Fisheries Management	Utah State University
	Graduate Studies 1984-1987 Major: Fisheries Management.	University of Idaho.

Jay Hesse is the Research Coordinator for the Imnaha River Smolt Monitoring Program project. Mr. Hesse has five years professional experience as a Fisheries Research Biologist and as the Research Coordinator. He is responsible for the technical direction and supervision of fisheries research projects, research coordination, and research representative at state and federal meetings. This position is LSRCP funded and fills 0.05 FTE.

Education:	Bachelor of Science, 1992 Major: Fisheries and Wildlife	Michigan State University
	Master of Science, 1994 Major: Fisheries	Michigan State University

R. Glen Szerlong is a Fisheries Research Biologist who assists in the conduct of the Imnaha River Smolt Monitoring Program project. Mr. Szerlong has 3.5 years professional experience as a Fisheries Biologist. This position is LSRCP funded and fills 0.5 FTE.

Education:	Bachelor of Science, 1996 Major: Fisheries Biology	Colorado State University

Michael Blenden is an Assistant Project Leader for Lower Snake River Compensation Plan Tribal hatchery evaluations and assists in field data collection, data analysis and report writing for the Imnaha River Smolt Monitoring Program project. Mr. Blenden has seven years professional experience as a Fisheries Research Biologist. This position is LSRCP funded and fills 0.3 FTE.

Education:	Bachelor of Science, 1990 Major: Fisheries Management	University of Idaho

Glenda Claire is a Fisheries Production Assistant who assists in the conduct of the Imnaha River Smolt Monitoring Program project. Ms. Claire has eight years of experience in the field of fisheries. This position is LSRCP funded and fills 0.5 FTE.

Education:	Bachelor of Science, 1987 Major: Microbiology	Oregon State University

Joe McCormack is a Fisheries Production Assistant who assists in the conduct of the Imnaha River Smolt Monitoring Program project. Mr. McCormack has six years of fisheries expeience. This position fills 1 FTE.

Education:	Technical Certificate, 1992	College of Southern Idaho

Section 10. Information/technology transfer

Information is disseminated to the PTAGIS database and the FPC database. The FPC disseminates the smolt passage data twice a month. Annual results are presented in the form of BPA annual reports. Annual report presentations are provided at smolt seminars and state AFS chapter meetings as time allows.

Congratulations!